How to Harvest Ice

Gifford-Wood Co.

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Established 1814

NEW ENGLAND HEADQUARTERS
Nos. 51-52 No. Market St.
BOSTON, MASS.

WESTERN HEADQUARTERS
No. 123 No. Jefferson St.
CHICAGO, ILL.

Factories
HUDSON, N. Y.

FOREWORD.

THREE quarters of a century spans the commercial development of the natural ice industry. Once an article of luxury and used in small quantities it is now one of the most important of every day necessities. In its annual harvest and distribution it requires an investment of millions of dollars and the services of hundreds of thousands of men.

Extending over that entire period we have been affiliated with the iceman in all parts of the country. In no small degree his hardship and failures, as well as his prosperity, have been shared by us. With such a common interest between us, co-operation has naturally resulted and where improved tools and apparatus could be used to advantage we have always worked toward increasing the productiveness of his labor.

On account of this familiarity with the methods employed in different parts of the country we each year receive many letters asking for advice. Some of these inquires, as may be expected, are from those unacquainted with the ice business. To furnish the information desired in full and yet concise form, this pamphlet was first issued over thirty years ago. The present enlarged edition indicates some of the many improvements which have taken place during that time.

As the operations vary so greatly in different sections, only a general view of the subjects is possible within the limits of these pages. It is hoped, however, that the suggestions offered may be found of interest to the reader, helping him to some degree at least in performing the work with system and economy. Where more extended advice is desired on any detail of harvesting, we are very glad to hear from our customers and thus be able to place our experience more directly at their service.

The numbers, used in this book, in naming Ice Tools, are those to be found in our General Catalog of Ice Handling Machinery and Tools.

The Natural Ice Business.

The conditions necessary for the formation of natural ice are most widely distributed. As these requisites are chiefly the gift of Nature, requiring the expense of but little preliminary development, the cost of the ice in its native state is almost nothing. When harvested, stored and distributed by the use of approved methods and appliances, it therefore has an immense advantage over the ice produced by mechanical refrigeration.

Fig. 1. Field Scene.

Competition with manufactured ice has been most beneficial for the natural ice industry. Greater effort is now put forth to harvest the purest ice obtainable, to prevent any contamination on its way to the consumer, and to market only that which is clean in appearance and regular in form. By giving attention to these details, the most exacting requirements of the public are met, and the natural ice business in any community is placed on the firmest foundation possible.

Investigations by the most competent scientists have done much to increase confidence in the purity of natural ice. It has been proven most conclusively that holding ice in storage for a number of months destroys all germs which may have been present on the field.

Simple as the ice business may seem, it is composed of a large number of details, and economy in obtaining a crop requires careful attention to each. The importance of suitable facilities for preparing

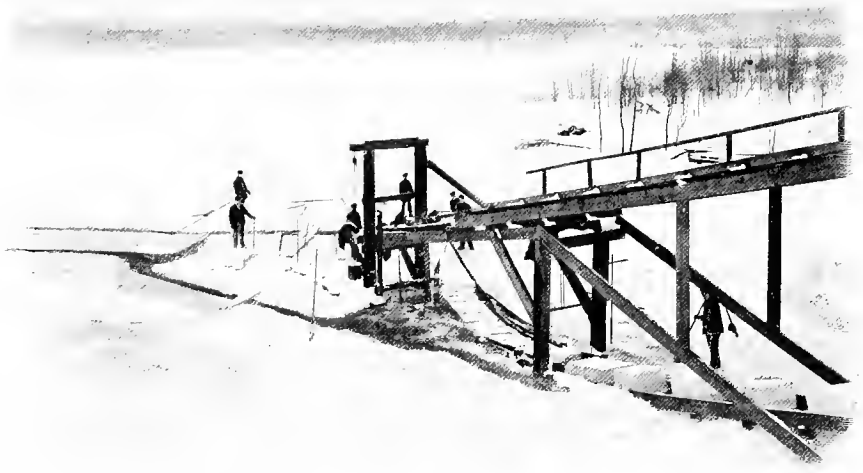

Fig. 2. Elevator Conveyor Apron.

and cutting the field and for quickly and cheaply housing the ice are so well appreciated that no arguments in their favor are necessary.

Fig. 3. Field Scene.

Time is often the factor which determines whether a crop shall be secured or lost. A breaking up of the field may leave the poorly-equipped harvester with one-half or one-fourth a crop, while his more up-to-date competitor is fully prepared for another season's trade.

The housing of nothing but marketable ice is now accepted by the most progressive harvesters as absolutely essential to economy. A cake of ice on the field is practically raw material with but little value. When placed in the house, its worth has been increased as a result of the labor expended upon it; and when on the delivery wagon ready for the customer, it is more valuable still. As the dealer's interest is best served by delivering nothing but regularly-shaped cakes of good ice, the elimination of all defective or unsalable pieces can be done at the smallest actual cost before it reaches the interior of the house. While this is better than to remove the waste later, the most economical plan is to so conduct the field operations that the number of defective cakes is reduced to a minimum. The saving due to such a procedure will be very evident, since the creation of any waste material whatever represents a certain amount of labor which is a total loss.

Fig. 4. Field Scene.

The ice should be of good quality and of suitable depth to allow for surface dressing, thus leaving it the most desirable thickness for cutting to supply the trade. Careful attention to the grooving and calking makes the barring off easy, and the regular cakes thus obtained are more easily handled, pack better in the house, and cut up with small waste when delivered to the customer.

Ice from different parts of the field may vary several inches in thickness, and if the cutting extends over a period of two or three weeks the ice will often make that amount during the harvest. The use of a planer on the incline removes all surface impurities, reduces the cakes to a uniform size, makes the storing easier, greatly reduces the amount of waste ice going into the house, and cuts down the expense of removing the ice tremendously.

One harvester following these lines may house 5,000 tons of ice a day, nearly all of which is salable and first-class, while another harvester giving little attention to the details will put up one-half as much with the same daily expense of operation, his crop including a large amount of ice which is either of an inferior quality or absolute waste. On account of the importance of doing each part of the work in the most economical manner, the various harvesting operations are described in the following chapters.

Size and Location of House.

From his knowledge of the market to be supplied, the harvester is usually able to estimate how much ice can be sold to advantage each season. The addition to this amount of 20% to 40%, as the conditions may warrant, to cover the shrinkage, will indicate the house capacity

Fig. 5. Housing a Small Crop.

necessary for a season's requirements. A cubic foot of ice weighs about 58 pounds, or measures nearly 35 cubic feet to the ton. The latter figure, however, cannot be used in calculating the marketable tonnage of a house, on account of the large amount of waste space existing between the cakes as they should be and are usually stored. The capacity of most houses is now estimated on a basis of one ton for every 45 cubic feet of house volume, measured inside the rooms, as a fair measurement for buyer and seller, although a few harvesters do not make so much allowance.

In selecting a suitable location, the demands of an increasing business should be thoroughly considered and the larger capacity which this may necessitate. The original building should be so placed that future extensions are possible without costly grading or expensive additions to the elevating apparatus. Too often the former receives proper attention, but not the latter, and an increase of several

new rooms requires either much additional machinery or getting the ice into these rooms under most unfavorable conditions.

Convenience in taking the ice out in the summer is an important factor affecting economy. The house floor is generally located at, or near, the ground level. With the wagon or car-loading platform three or four feet above this level, as is the common arrangement, the last few layers taken out must be pulled up a chute by hand or by chain conveyor, resulting, of course, in slower loading and additional expense. If not too expensive, houses should be built with their floors level with the loading platforms, with the latter the necessary distance above track or roadway for easy loading.

House Construction.

Wood is at present the most commonly used material for ice-house construction. Concrete has been employed to some extent with favorable results, and the almost total elimination of fire risk is such a

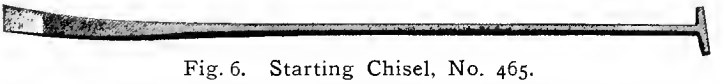

Fig. 6. Starting Chisel, No. 465.

strong recommendation for this type of house that its popularity will constantly increase.

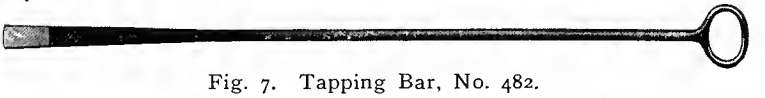

Fig. 7. Tapping Bar, No. 482.

Some wooden houses are constructed with single studding, others with a double row of posts — the air space, packing and other insulating features varying as well. The line to be followed in any given

Fig. 8. Scraping Scene.

case depends very largely upon the local conditions. The construction of an expensive house, warranted in one locality, might be the poorest kind of an investment in another. We have a large assortment of working drawings for houses of all sizes from the smallest to the largest, and these are included free of charge with the elevator drawings.

Size of Ice Cakes.

The size of cakes to be harvested should be selected to give the least amount of waste possible when cutting up for the trade. It is also desirable to house a cake of standard dimensions requiring no special tools or machinery. The prevailing sizes in the United States are 22 x 32, 20 or 22 x 28, 22 x 42 or 44, and 44 x 44, the latter size being cut only in Eastern Massachusetts and New Hampshire. A common size with the smaller harvesters is 22 x 22 inches, while some find even smaller cakes more desirable.

The foregoing points are preliminary to the work of harvesting, which may be divided into three parts, viz.: field work; hoisting into the house, and packing and removing; each of which will be briefly described in the following pages.

Size of Field.

The area laid out should be large enough, if possible, to fill the house with a single cutting. The general practice is to allow one acre of field with a thickness of 12 inches for each 1,000 tons of ice to be cut. This is under favorable conditions. It is well to make the field somewhat larger, to provide for soft weather, and considerable additional area should be added for windrows if a large surface is to be scraped.

Fig. 9. Use of the Boston Scraper.

Wetting Down.

It is seldom that a field of ice freezes to the desired thickness without having one or more falls of snow upon it, and as a result the harvester is nearly always called upon to handle this snow in one way or another before marking out the field. The first snow often comes when the ice is too thin to bear scraping, and if the weight of the snow is insufficient to sink the ice, the custom of tapping, or wetting down, is now very generally practiced. This should be done when all the indications are favorable for freezing the moistened snow solid. If the top only of the snow water freezes, forming a crust, and more snow should fall, there would be a space of water underneath the dry snow which would not readily freeze, and scraping would be impossible. A windy day should not be chosen on account of the drifting.

It is well known that a thick layer of snow on a field greatly retards the formation of the ice. Converting this into snow ice assists in making and also prevents dust and other impurities from being melted into the surface during a spell of soft weather. Cinders penetrate sap ice much less readily than solid ice.

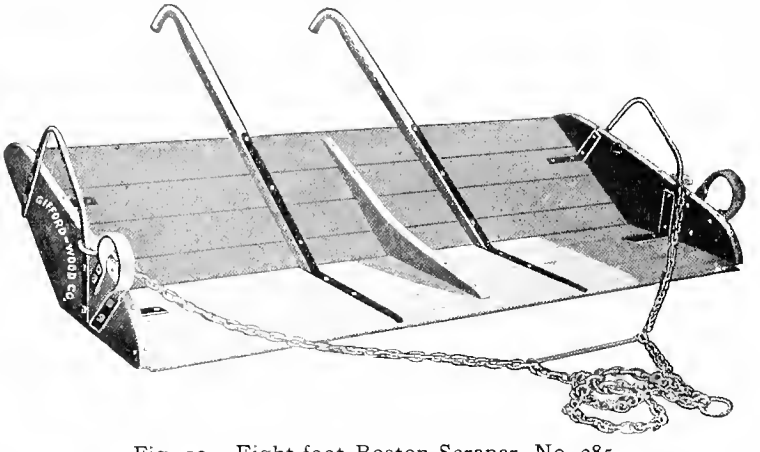

Fig. 10. Eight-foot Boston Scraper, No. 285.

Flooding the first two or three snows is a good protection against honeycombing by warm weather, and a coating of snow ice will also make the ice tougher and less liable to breakage through all of the subsequent operations.

The best reason for tapping where ice is handled by an incline elevator is the economy gained. An Elevator Planer will easily remove any amount of sap ice, and it has been proven by harvesters that the cost of wetting down and disposing of the chips made by the Elevator Planer is not more than 5% of the expense of scraping. This will be referred to in later chapters.

To wet down, a gang of men, each provided with a narrow-bladed chisel and spaced at regular intervals in a row, proceeds across the field punching holes in the ice as the men advance. Judgment should be used in the spacing of these holes, the distance apart varying from six to ten feet, as the conditions may warrant; the number and size of holes being such as to insure a thorough saturation of the snow.

A number of different tools are used for this work. If a small hole is desired on thin ice, the Ring Handle Needle Bar, No. 484 — see Fig. 51 — is the best. For thicker ice, a chisel-shaped tool is required. Some harvesters use the curved-bladed Starting Chisel, No. 465, illustrated in Fig. 6, although a better tool is the Ring Handle Tapping Bar, No. 482, shown in Fig. 7, which is made especially for this purpose, and cuts a smaller hole.

Scraping.

The operation of scraping is so costly that it should only be done when it is not feasible to wet down. The use of a horse scraper is a necessity when the ice is thick enough and the fall of snow too light for wetting down to advantage. If the ice has not reached the desired thickness, a light snow should be removed by scraper. Under these conditions it is the cheapest method available, and the field will then ice much more rapidly than while protected by a snow blanket.

If the field is small all snow should be scraped to the shore. Where an extensive area is to be cleared, this is, of course, impracticable, owing to the distance that it would be necessary to draw the

Fig. 11. Scraping Scene.

loads. The field is then divided off into sections, the snow from each being piled in dumps or windrows between them. When this plan is followed, greater acreage must be allowed, as considerable space is covered by the dumps. These are generally run at right angles to the main canal through which the ice is floated to the elevator. As the weight of the snow in these piles is usually great enough to cause the ice underneath to settle below the general level of the field, a plow

groove is sometimes made along the side of the windrows, which prevents flooding the cutting area. The dumps are located some 300 feet apart, leaving a good 250-foot field between them.

The scraper most extensively used is the "dust pan," or Boston Scraper, No. 284–5. Its extreme simplicity makes it inexpensive, yet effective, and very easy to operate. One of these scrapers is shown in action in Fig. 9, the implement only being illustrated in Fig. 10. It is made in two widths, No. 284 being 6-foot and No. 285 8-foot. Although the 6-foot size is nominally a one-horse scraper, two horses should be used if the snows are heavy.

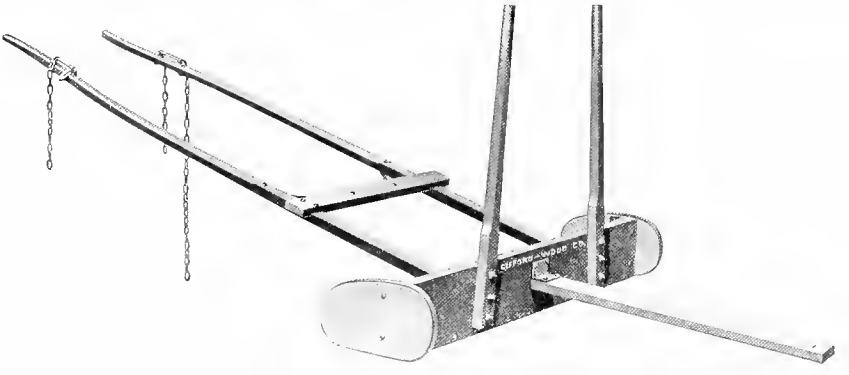

Fig. 12. Six-foot Clearing-off Scraper, No. 292.

The Clearing-off Scraper — see Fig. 12 — is made in three widths, 6-foot, No. 292; 7-foot, No. 293, and 8-foot, No. 294. It is used for removing light snows, plow chips, or for collecting the small furrows sometimes left by the large scraper.

Field Cultivating.

If the means of carrying the ice from the field to the house does not permit the use of the Incline Planer, field cultivating is the only method of removing snow ice or other objectionable material from the top before packing. There are cases, however, when field cultivating is to be recommended, even though the ice may later be cleaned up on

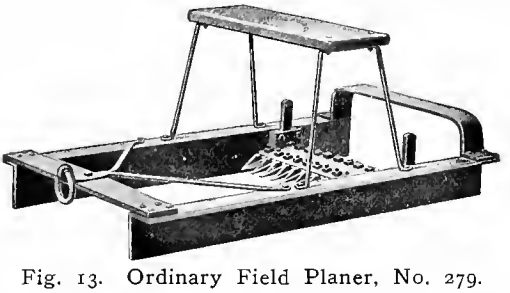

Fig. 13. Ordinary Field Planer, No. 279.

the elevator incline. Very frequently the weather is not severe enough to make ice rapidly. At such times the removal of a cutting of snow ice does much toward securing the desired thickness.

Another scheme is often practiced to secure an earlier harvest. The entire field is marked out with grooves running in one direction

as if the cutting operations were to follow. These grooves, generally made to a depth of three inches, allow the cold air to penetrate the body of the ice with a noticeable increase in its thickness. If the water of the pond or lake is naturally still, the motion given it by working the field also helps in the freezing.

Cultivating.

In the use of the Ordinary Field Planer, No. 279, shown in Fig. 13, the field is laid out with the marker; the spacing of the grooves being an inch or so less than the width of the planer, or at least no wider than the planer. This is an inexpensive article and is very largely used by the smaller harvesters.

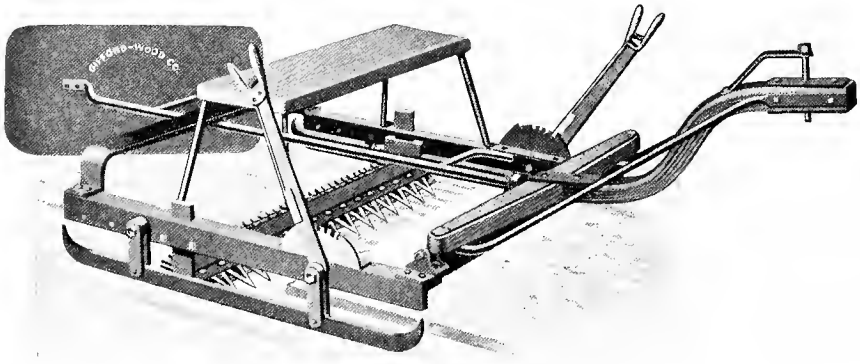

Fig. 14. Perfection Field Planer, No. 270.

The Perfection Field Planer, No. 270, illustrated in Fig. 14, is a larger and much more efficient tool. With it no preliminary grooving is necessary, and a cut forty inches in width may be taken. With two

Fig. 15. Use of Field Cultivator.

good horses on the pole three inches of ice may be removed, a lesser amount being obtained when so desired by means of the gauge levers on both sides. The chips are run into a furrow by the scraper attachment, shown in Fig. 14, and may afterward be removed from the field in the same manner as snow. The use of the Field Cultivator is illustrated in Fig. 15.

Measuring Thickness.

This should be done at frequent intervals so that the harvester is at all times familiar with the conditions in any part of the field. The

Fig. 16. Measuring Rod, No. 512.

rapidity with which ice makes varies considerably in different portions of the field. The tools used are the Ice Auger, No. 510, and the Measuring Rod, No. 512, shown in Figs. 16 and 17.

Fig. 17. Ice Auger, No. 510.

As the thickness of the ice approaches the desired amount, the next step is —

Lining out the Field.

To run the first line through the proposed field a stake is placed at each end as a guide. A long plank, tested as a "straight edge," is put in line with the stakes and the cutting tool run along its side, after which the plank is pushed forward and the groove extended. The best tool for this work is the 6-inch Hand Plow, No. 409, shown in Fig. 18. Drawing the first line is well illustrated in Fig. 19, and that the groove may properly serve as a guide for the teeth of the Horse Marker it should be ¼ inch to ½ inch in depth. Some simply stretch a long line and run the Hand Plow just clear of it.

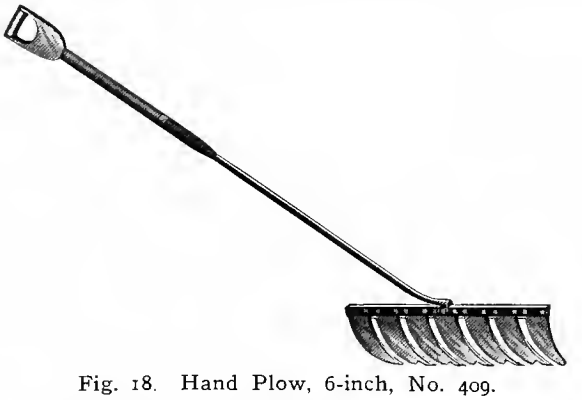

Fig. 18. Hand Plow, 6-inch, No. 409.

The Line Marker, No. 500, shown in Fig. 20, is used as a substitute for the Hand Plow for small operations.

In laying out the cross lines care should be taken to run the first at right angles to the groove already made. A large wooden square should be used and will avoid marking out the diamond-shaped cakes

Fig. 19. Use of Hand Plow.

sometimes resulting from careless methods. Such a square can be easily made as follows: Attach two 10-foot boards with a single nail near one end of each; mark off a distance of eight feet on the edge of

Fig. 20. Line Marker, No. 500.

one board and six feet on the edge of the other; then place a third board, serving as a " stay lath," diagonally across the two, adjusting the latter until the two marks are diagonally ten feet apart in a straight line. The boards may then be nailed together solidly to form the desired right angle. Such a square is shown in the background of Fig. 19.

Marking Out.

After " lining out the field," the marking and plowing is next to be done. Whether the operations are to be on the largest scale, requiring several sets of Markers and Plows, or on a scale not as large, requiring one Marker only and one or more Plows; or small enough to be done by a combination Marker and Plow called a Swing Guide Plow; the procedure following the lining out is the same in all cases.

The teeth of the Marker or the Plow to be used in marking out are run in the shallow groove made by the Hand Plow or the Line Marker, and the trip is made across the field either without the Guide attached, or with the Guide running loosely on the surface of the ice with its handle thrown out of notch. In this manner the first groove 2½ or 3 inches deep is obtained. The first cross-groove is made in the same manner, and these two grooves form the basis of the subsequent marking out.

The Swing Guide, whether attached to the Marker or to a Plow, is a gauge, or spacer, for obtaining uniformity in the distance between the grooves. If the cakes are to be square, as 44 x 44 inches, or 22 x 22 inches, the Guide is made for one width only; but if longer in one direction than in the other, as 22 x 32 inches, or 22 x 28 inches, either two separate guides are used, or a guide that is adjustable for both widths. Two separate guides are naturally more rigid than an Adjustable Guide; but the latter is certainly very convenient and is, therefore, the more popular.

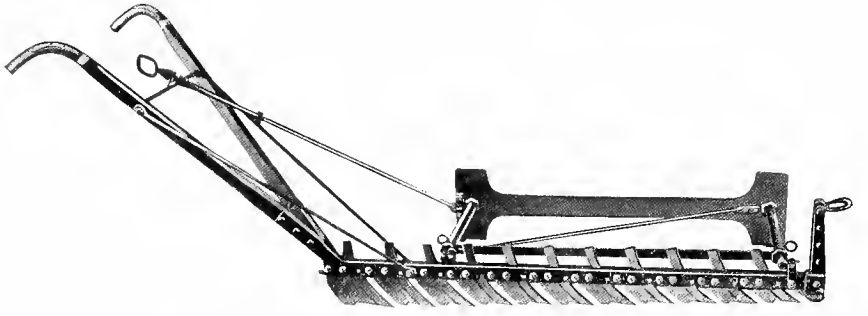

Fig. 21. Patent Perfection Marker, No. 330.

In making the next parallel line, the Swing Guide is placed in the groove first made, and the teeth cut a new groove. At the end of the line the Guide is swung to the opposite side by its handle and the marking out is continued in the same manner. In making each cut with the marking-out implement, particular care should be taken to hold it in a vertical position, as otherwise the groove is started on an angle and will be so continued by the following trips, resulting in

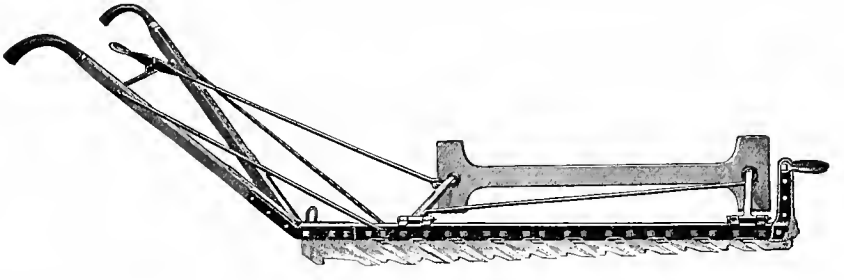

Fig. 22. Four-inch Marker with Swing Guide No. 355.

ill-shaped cakes. Fig. 22 illustrates the Solid-tooth Marker with 22-inch Swing Guide attached, No. 355, and Fig. 21 the style we call the Perfection Marker, which is fitted with inserted teeth, by the use of which the depth of the Marker is not reduced by filing. This latter feature will be described more fully under paragraph "Perfection Markers and Plows."

Plowing Down.

For largest operations, one or more complete sets of grooving implements is a necessity. Each set should include one or two Markers for the first cuts, Plows with increasing depth depending upon the thickest ice which can be anticipated. The deepest tool should

be able to cut fully two-thirds the thickness of the ice without bringing the Plow-back down to the groove. The importance of deep plowing is fully recognized by the experienced harvester, as it is one of the first requisites in obtaining regular cakes; otherwise, in barring off,

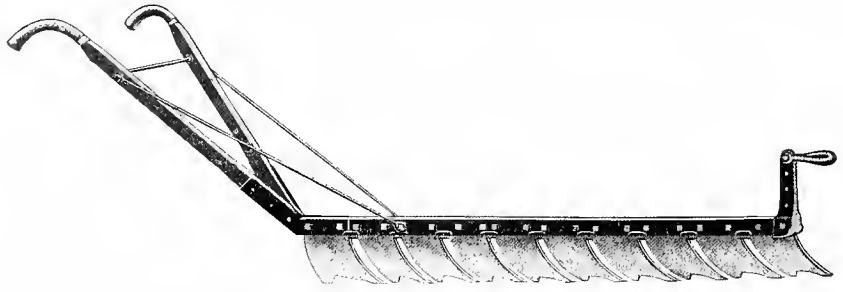

Fig. 23. Six-inch 9-tooth Plow, No. 371.

the seams may break unevenly, and thus produce cakes having "lips" or "flanges."

If, for instance, the ice is 12 to 14 inches thick, each set of machines employed should contain, besides its one or two Markers, a 6-inch

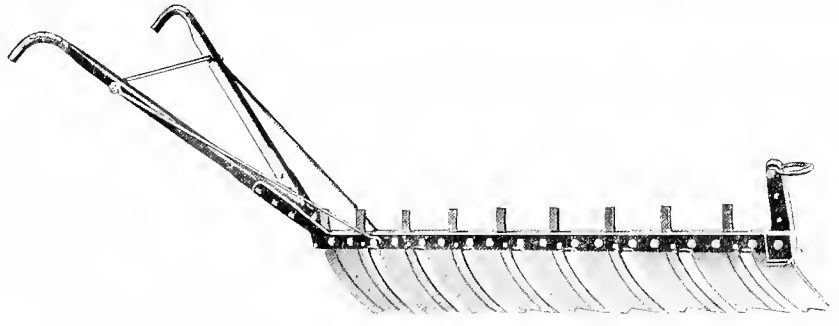

Fig. 24. Eight-inch Patent Perfection Plow, 8-tooth, No. 338.

9-tooth Plow, No. 337 or No. 371, the No. 371 is shown in Fig. 23; an 8-inch 8-tooth Plow, No. 338 or No. 374, see Fig. 24 for 338 and Fig. 25 for No. 374, and a 10-inch 6-tooth Plow, No. 339 or No. 377, Fig. 26 illustrates No. 377. For ice 15 inches thick, add to each set a 12-inch

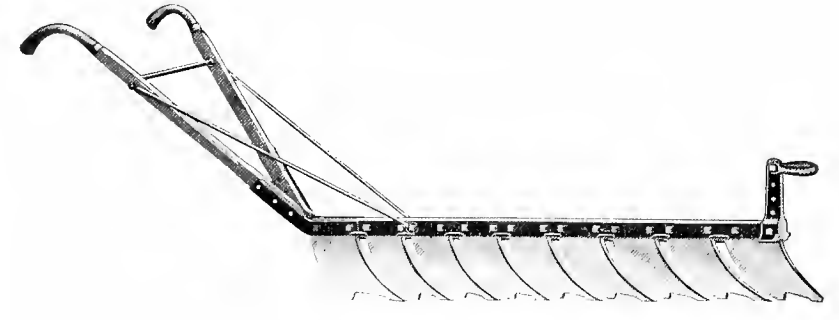

Fig. 25. Eight-inch Plow, 8-tooth, No. 374.

5-tooth Plow, No. 340 or No. 379, No. 379 is shown in Fig. 27. Fourteen-inch and 16-inch Plows, No. 381 and No. 382, are used for still thicker ice, and we also make an 18-inch, No. 383.

A view on the field in which a good number of these tools is in use is given in Fig. 28.

Market teeth are gauged to cut a width of groove of $\frac{5}{16}$ of an inch; the teeth of 6-inch, 8-inch, and 10-inch. Plows are each slightly narrower, and on a 12-inch Plow the width is but $\frac{5}{16}$ of an inch. Plows must, therefore, always be run in the order of their depths.

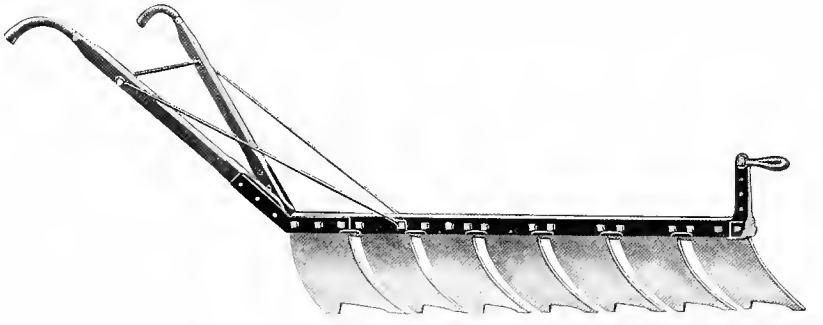

Fig. 26. Ten-inch Plow, 6-tooth, No. 377.

The feed given to ice-plow teeth is such that each tooth makes a cut of ¼ inch. Thus, one trip with an 11-toothed Marker will cut a groove 2½ or 3 inches deep; a 9-toothed Plow, 2¼ inches at each trip; an 8-toothed Plow, 2 inches, etc.

Perfection Markers and Plows.

A style of Markers and Plows, very popular with many advanced harvesters, is the Patent Perfection, or inserted tooth variety, shown by Figs. 21 and 24. This line is made in all sizes from Marker to 12-inch Plow. Owing to its construction, this type is somewhat more expensive than the solid tooth kind, but its advantages more than

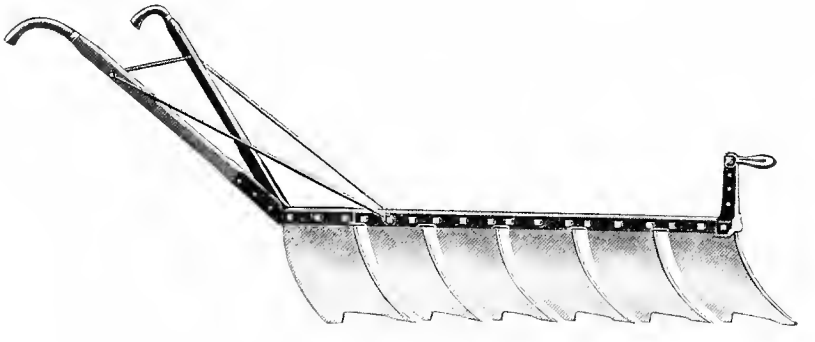

Fig. 27. Twelve-inch Plow, 5-tooth, No. 379.

outweigh the extra cost with the mechanically inclined operator. Each tooth is made in two pieces, the larger part being firmly bolted to the Plow-back while the other is adjustable and carries the cutting edge; yet, when locked, they are as solid as if one piece. A broken point on

any tooth is easily remedied by regrinding this piece and readjusting; whereas with the solid tooth Plow, either a new tooth would be

Fig. 28. Plowing and Marking Scene.

required or it would be necessary to do a large amount of filing to level the points properly. Another great advantage is that the implements always retain their full depth.

Smaller Operations.

Where a full set of Markers and Plows are not needed for the amount of ice to be harvested, a good combination would include a Marker, 8-inch 8-tooth, and 10-inch 6-tooth Plows, and in this case it would be well to have the 8-inch 8-tooth Plow supplied with a Swing Guide, to be used only when the regular Marker may become tempo-

Fig. 29. Use of the Plow.

rarily dulled by stones. Of, if two plows in addition to the Marker are not needed, a 9-inch 7-tooth Plow, No. 376, will answer well for

12 or 13-inch ice. All our plows are made to follow themselves in successive cuts without binding, although naturally a succession of graded plows will run rather more easily. Figure 29 shows a single plow in operation.

Marking and Plowing with One Tool.

For harvesting a small crop, the ice man will find a single Plow with Swing Guide entirely practicable. Although Guides are sometimes attached to Plows as deep as 12 inches, we do not recommend

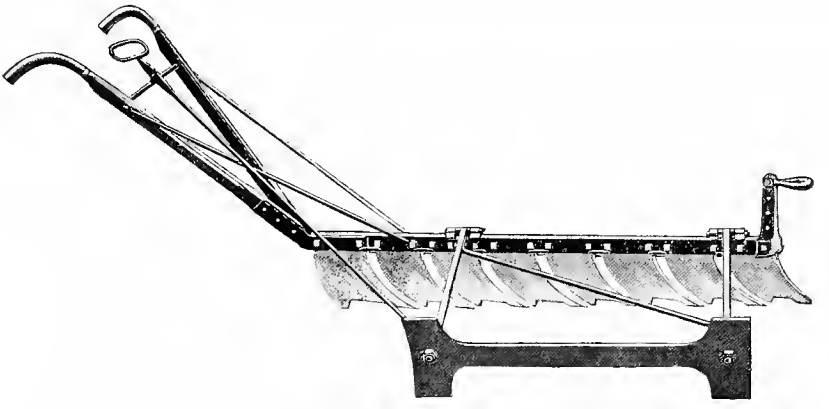

Fig. 30. Eight-inch Plow with Swing Guide, 7-tooth, No. 388.

the Swing Guide combination for a Plow deeper than 9 inches. Marking out cannot be done as straight with a deep Plow and Guide, and a long tooth will naturally cut more slowly than a short and more rigid one. Although the cutting as done in this way is a little slower than with a full complement of tools, it is incomparably superior to the old style method of sawing, as a horse and plow will do work equivalent to what a large number of men can accomplish at sawing. No one who cuts 100 tons of ice can afford to be without a good ice plow.

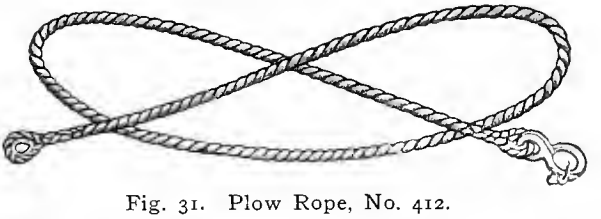

Fig. 31. Plow Rope, No. 412.

For those who want the best for long, continued service, the high-grade style of Plow and Guide shown in Fig. 30 is to be most highly recommended, as it is of the finest quality in all respects.

Plow Ropes for use on Markers and all Plows should be at least 8 feet long between whiffletree and Plow in order to prevent the front teeth being lifted from their work by the draft. One end at least should be provided with patent sister hooks, as illustrated in Fig. 31. We always carry a stock of these for the convenience of our customers.

Dairymen's Plows.

The great demand for a Plow for wide serviceability for small harvesters has resulted in a complete and less expensive line known as the "Ice King." This popular type is made in three depths, 8, 10 and 12-inch, each provided with a clearing and 5 cutting teeth, blued, and made with or without guides, and with guides of both non-adjust-

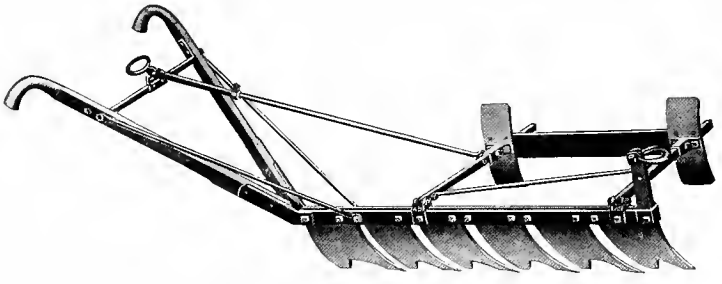

Fig. 32. Dairymen's "Ice King" Plow with Adjustable Swing Guide, No. 320.

able and of adjustable patterns. We supply these in large numbers to dairymen, farmers, and others harvesting from 50 to 1,000 tons. The substantial construction is well shown in Fig. 32, illustrating No. 320 Plow with Adjustable Guide. Send for special circulars of this line.

Ice Sawing Machine.

We occasionally have inquiries as to the economy of cutting ice with a circular saw driven by some form of motor, such as a gasoline engine. Where experiments on this class of apparatus have been made we have investigated the results carefully, but the machines up to this time have not been commercially practicable. The cost of such a power-driven outfit at the present stage of development would be well-nigh prohibitive, amounting to several times that of a full set of Marker and Horse Plows, which latter would cut fully as much ice in a given period. Simplicity in all details of his harvesting equipment is required by the ice man, and unless the work can be done much more cheaply he will not find it to his advantage to use a far more complicated and expensive tool.

Outline of Cutting.

A little system in laying out the various cutting operations will not only greatly increase the ease of harvesting, but will much more than pay for itself in the economy secured. The ice is detached from the field in pieces usually known as floats, which are made of suitable size for convenience in handling. If the field is at considerable distance from the house, the floats are made of large size, as the ice in this form may be more easily drawn to the point where it is to be divided into strips and subdivided again into single cakes.

The main channel through the field should be of ample size for the passage of these floats, and the best arrangement for cutting up is secured if this main channel and the single-cake or house channel are at right angles to one another. The advantages of these conditions will be mentioned later.

The house channel should be opened up on the day preceding the running of ice up the incline, and after a considerable surface has been marked and plowed. The channel should be at least eight inches wider than the single cakes. To cut this out, plow the two grooves on either side as deep as possible, slanting the grooves slightly so the strip will be a little wider at the bottom than at the top, saw both grooves through,

Fig. 33. Opening the Channel.

and then sink the strip after breaking it into pieces of suitable size. Some dealers harvest these cakes, but time is gained by making ready for a faster run. Figure 33 well illustrates opening the channel and sinking the pieces.

Sinking the Header.

This is really the same process as opening the channel, but as the extension of the house channel becomes the end, or head, of the main channel, which is at a right angle to it, the pieces which are sunk are called "the header." Then too, another header, at a right angle to the house chanel, has to be sunk on the shore side of the main channel, which is plowed, sawed on a slight taper perpendicularly so it can be sunk without binding, and the pieces pushed under the edge of the field which is not to be harvested. Cutting out the header referred to is shown at A B C D in Fig. 34.

All of the deep plowing near the header should be completed before breaking it out, so that it will not be necessary to bring the horses near open water. The Saws used vary in length from 4 feet to 5½ feet, but the 5-foot, No. 422, shown in Fig. 35, is most commonly used.

Fig. 34. Sinking the Header.

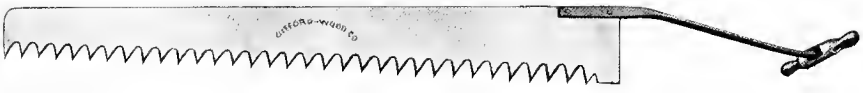

Fig. 35. Five-foot Saw, No. 427.

Calking.

Fig. 36. Use of Calking Bar.

Before exposing any plowed seams to open water, even in the work of opening channels and sinking headers, the work of calking, shown in Fig. 36, is a most important detail of harvesting, as care and thoroughness at this point will save an immense amount of labor in subsequent operations. If the plow grooves are left open, water readily enters and may run throughout the field. Cold weather at this time would freeze the grooves up again, making replowing necessary. To avoid the possibility of this additional work all grooves on the field exposed to the water as well as those on all sides of every float should be properly calked before the floats are detached. The Hollow Handle Calking Bar, No. 457, shown in Fig. 37, is generally used. The grooves should be cleaned out to the bottom by giving the bar a side motion, before any tamping of the chips is done, as otherwise an opening may exist at the bottom through which the water will pass. Thoroughness in this detail is very important; and as a further emphasis it may

here be mentioned that incomplete calking is responsible for a very large part of the poor ice which is placed in storage. This should be very carefully watched throughout the entire harvest whenever freezing weather exists.

Fig. 37. Calking Bar, Hollow Handle, No. 457.

Barring off the Floats.

With the two headers on one end and on one side of a float open, the third side is sawed, as shown at AB in Fig. 38. The only operation then necessary to separate the float from the field is to bar off on the line BC in Fig. 38. This float groove along which the break is to be

Fig. 38. Sawing at End of Float.

made and also the grooves to be sawed should be plowed one or two cuts deeper than other parts of the field. The best tool for barring off is the Two-tined Splitting Fork, one form of which, No. 443, is shown in Fig. 39. It is made in different weights and with either knob or ring handle. The tines are so shaped as to wedge at the top of the groove, at the same time striking at the bottom if the groove is of

Fig. 39. Splitting Fork, Ring Handle, No. 443.

average depth. The blow starts a seam at the bottom, and by repeating these thrusts at spaces of a few feet the groove will soon open and the float separate from the field. A little experience will enable one to quickly determine by the dull cracking sound at what intervals the blows should be made. This operation is well illustrated in Fig. 40.

The Lynn Splitting Bar, No. 446, see Fig. 41, is preferred by some to the Two-tined Splitting Bar. If the ice is not thick, however, so that the grooves are plowed to a depth of about six inches only, the

Fig. 40. Barring off the Floats.

Four-tined Fork Bar, No. 449, see Fig. 42, may be successfully employed as the tines are made of the proper taper for shallow grooves.

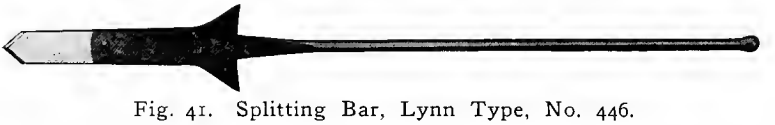

Fig. 41. Splitting Bar, Lynn Type, No. 446.

The size of floats vary with different harvesters. The object of floating sheets of ice from the field to the elevator channel instead of towing single strips or cakes is merely because it saves men, is therefore cheaper, and makes more rapid housing possible.

The floats are now drawn toward the house channel or slip to be separated into strips. This work is often done by men using 12, 14, 16 or 18-foot Ice Hooks, as shown in Figs. 43 and 44. Some harvesters,

Fig. 42. Fork Bar, Ring Handle, 4-tined, No. 449.

however, prefer to use horses for this work, in which case the No. 438 Towing Hook, Fig. 45, is used, as it can be applied to the surface of the float at any desired point. This is attached at the end of a long rope, the length being sufficient to allow the horse to walk some distance back from the edge of the channel. In some cases small steam or gasoline launches are used, towing several floats together. To prevent waves washing over floats in rough water some harvesters place corner

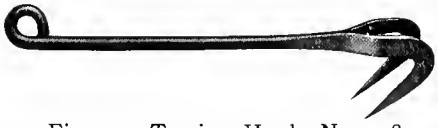

Fig. 45. Towing Hook, No. 438.

boards along their weather sides. Figure 44 well shows the right angle relation between the main channel and the house channel, and the way the latter is provided with a temporary platform.

Fig. 43. Bringing Floats to Elevator.

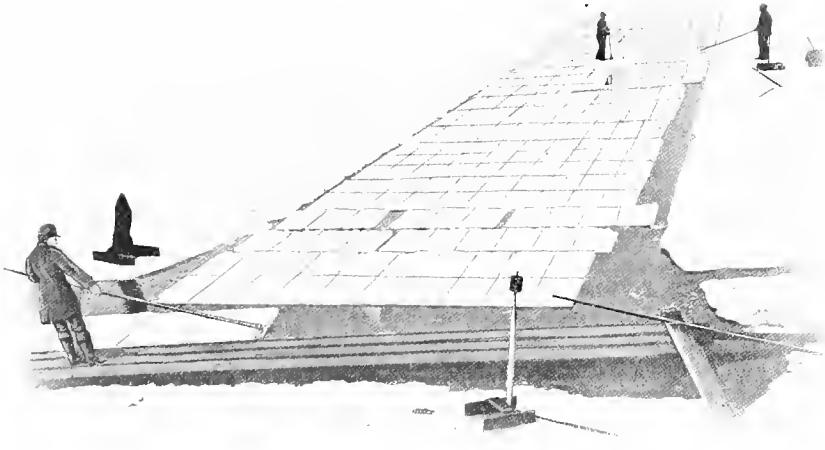

Fig. 44. Main Channel with House Channel at Right Angles.

Barring off the Strips.

As the floats approach the house, or elevator channel, strips extending across the full width of the floats are broken off, which operation is shown in Fig. 46. The tool best adapted for this work is

Fig. 46. Barring off Strips.

the Three-tined Needle Bar, No. 486, Fig. 47, although some use the older-fashioned, No. 451, Three-tined Fork Bar, Fig. 48. The strips

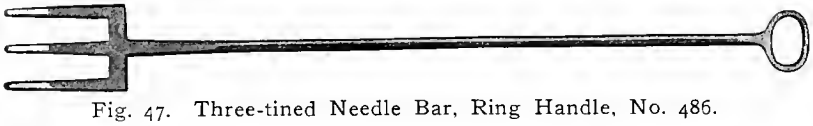

Fig. 47. Three-tined Needle Bar, Ring Handle, No. 486.

Fig. 48. Three-tined Fork Bar, Ring Handle, No. 451.

are now run into the house channel or elevator slip, ordinary Ice Hooks, 5, 6 or 8-foot long, Fig. 49, being used for their handling.

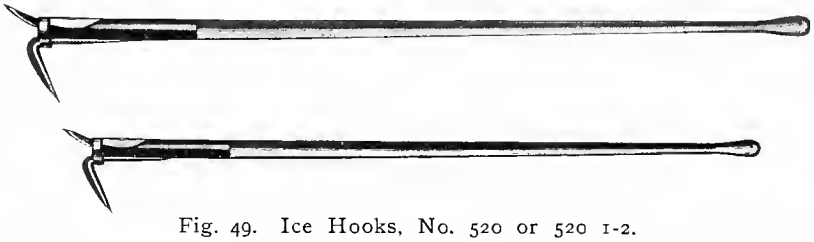

Fig. 49. Ice Hooks, No. 520 or 520 1-2.

The best harvesters, taking ice from lakes, have wooden platforms built on either side of the elevator channel, as shown in Fig. 50.

Dividing into Cakes.

Feeding the strips into the elevator channel is illustrated in Fig. 50, but Fig. 51 shows much better the detail of breaking up into the individual cakes. The shortness of the groove makes a light tool

Fig. 50. Feeding Ice to the House Channel.

desirable, and there are several which may be used to advantage, depending upon the condition of the ice.

If the grooves are frozen up, the No. 486 Three-tined Needle Bar, Fig. 47, is the best tool. For grooves frozen less hard, the No. 485

Fig. 51. Dividing into Single Cakes.

Two-tined Needle Bar, Fig. 52, is excellent. The No. 480 Saw Toothed Chisel, Fig. 53, has some friends; the No. 482 Tapping Bar, Fig. 7, is

Fig. 52. Two-tined Needle Bar, Ring Handle, No. 485.

used; also the No. 476 or No. 477 Splitting Chisel, Fig. 54; and for high platform work, the 6-foot No. 490 Canal Chisel, which has a blade like the No. 476 Splitting Chisel.

Fig. 53. Saw Tooth Chisel, Ring Handle, No. 481.

If the calking has been thoroughly done and the grooves are dry, the No. 484 Canal Needle Bar, Fig. 55, also known as the Single-tined Needle Bar, is more generally employed than any other, as it is very light Whichever is used, a single blow should sever the cake from the strip.

Fig. 54. Splitting Chisel, Ring Handle, No. 476.

Chips of ice and slush are apt to collect in the elevator channel, and the No. 505 Scoop Net, Fig. 56, is used for clearing out this obstruction. Sieve Shovels are also quite popular for this purpose.

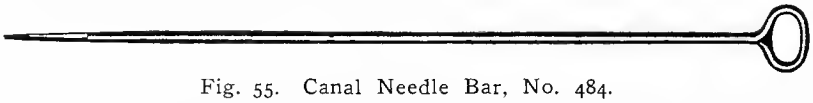

Fig. 55. Canal Needle Bar, No. 484.

The cakes are now ready to be removed from the water and run into the house, or to a loading platform for transportation. The No.

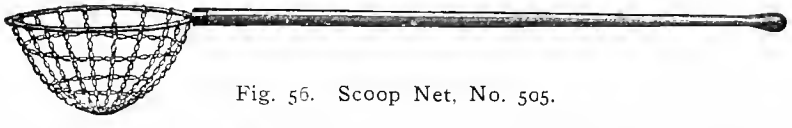

Fig. 56. Scoop Net, No. 505.

502 Elevator Fork, Fig. 57, is designed especially for feeding the cakes to the elevator, the two pushing points giving better control of the ice than the ordinary Ice Hook.

Elevating Apparatus.

Success in the rapid and economical harvesting of a crop of ice depends to a very great extent upon the means of handling it between

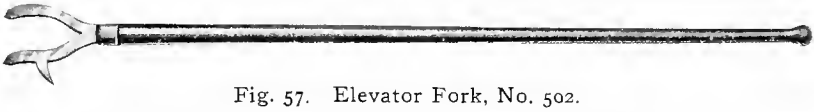

Fig. 57. Elevator Fork, No. 502.

the single cake canal and the house. Energetic and systematic methods on the field are good so far as they go, but the best results

can only be obtained by continuing these until the ice is placed in storage. This article is intended to refer more especially to the field operations and the tools commonly used, and therefore only a brief outline of the elevating apparatus will be given. Complete catalogues are issued by us each year in which all standard and many special elevators are illustrated and their construction explained, as well as

Fig. 59. Pole Grapple, No. 433.

Fig. 58. Jack Grapple, No. 436.

a detailed description of all tools. We are very glad to mail these to any one interested, also to supplement such information with suggestions and estimates when the opportunity is given us.

Small Harvesters.

The smaller harvester is now as keenly aware of the need of suitable apparatus as is his neighbor engaged in a more extensive business.

Fig. 60.
Self-Lubricating Upper Gin, No. 710.

Fig. 61.
Self-Lubricating Lower Gin No. 711.

Those who are content with no machinery whatever get along with the old-fashioned Grapples shown in Figs. 58 and 59 for incline work. For this work, good, metalline-bushed gin wheels, which need no oiling, are much to be preferred to common cast-iron wheels. See Figs. 60 and 61.

The Single and Double Gig Elevators, the latter of which is shown in Fig. 62, are convenient appliances, as they will handle a sufficient

amount of ice, and no power other than that of horses is necessary. As many as seven cakes a minute may be raised by the Double Gig Elevator, and a little estimating will show that a fair-sized house may be quickly filled by its aid.

A machine very popular with the smaller harvester is the Perpendicular Elevator, Fig. 63. This may be operated by a gasoline engine and will lift twelve cakes per minute to any height desired. It is especially popular with the dairying firms, several of the largest in the country having one at each of their widely separated plants.

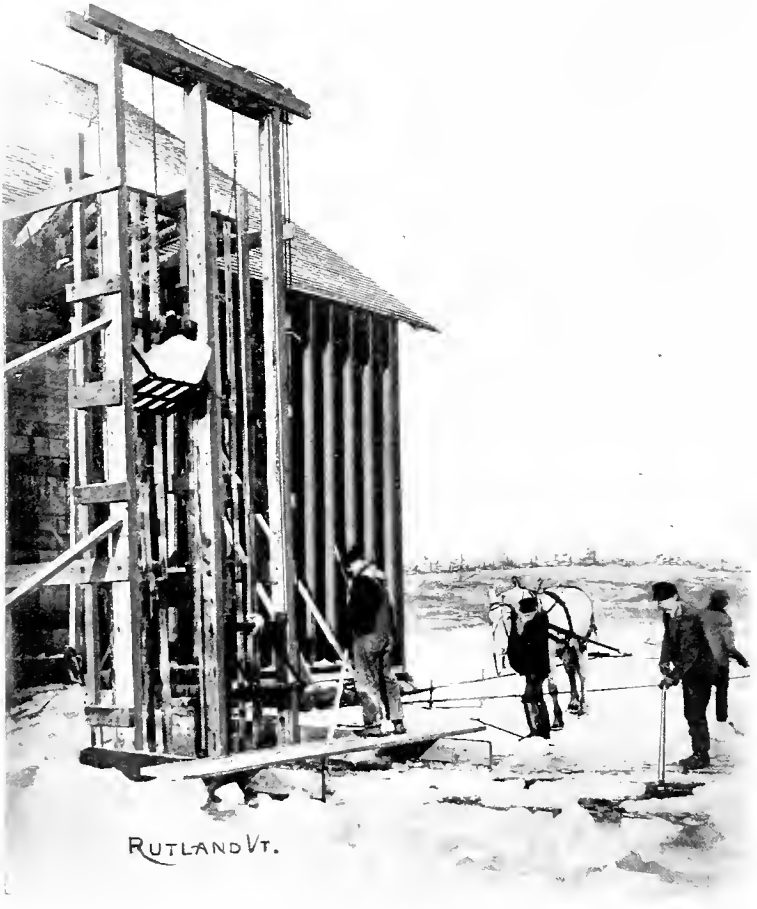

Fig. 62. Double Gig Elevator.

When the house capacity is greater, the elevator should be of the Incline variety. More ice may be handled in a given time, and there are also other advantages which recommend it for consideration. The Incline Elevator makes the use of an Elevator Planer possible, which cannot be adapted to any vertical-lift machine. The low cost of making the snow into snow ice and planing off on the incline has already been referred to under the heading of "Wetting Down," page 11.

Some of the advantages of the planing will be mentioned in the next section.

The elevators are variously designated as Side Feed, Undershot and Overshot, depending upon the method of delivering the ice cakes

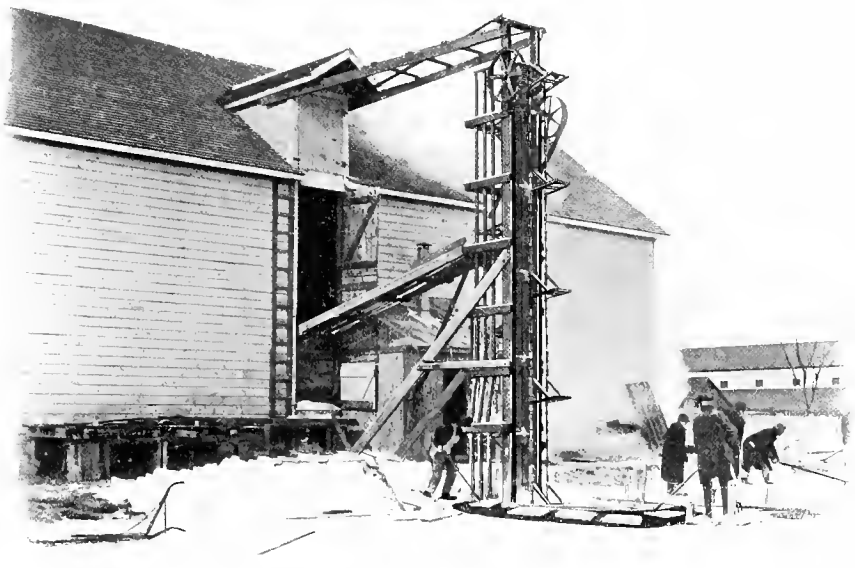

Fig. 63. Perpendicular Elevator.

to the feeding end or "apron." With the smaller houses the ice may be run by gravity direct from such an incline into storage.

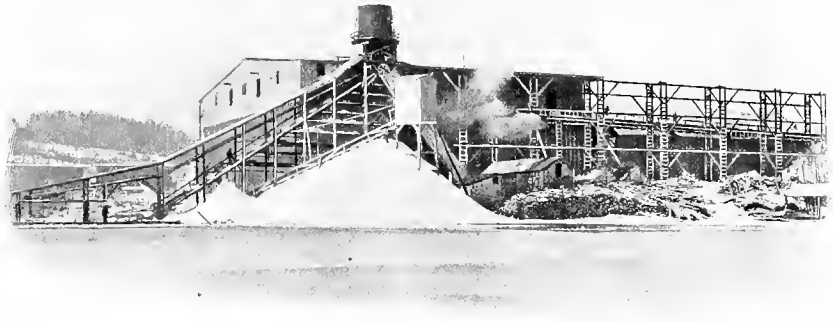

Fig. 64. Incline Elevator and Gallery Conveyor

Larger Harvesters.

Where the house consists of a number of rooms with doors in a row, an adjustable gallery conveys the ice from the elevator along the side of the house, a portion being switched into each door. This gallery is raised as the rooms are filled. If the length exceeds 100 feet it is generally provided with a conveyor chain for insuring a uniform delivery of the ice. The largest houses are usually equipped with the Elevator Conveyor, which has the advantage of a continuous double

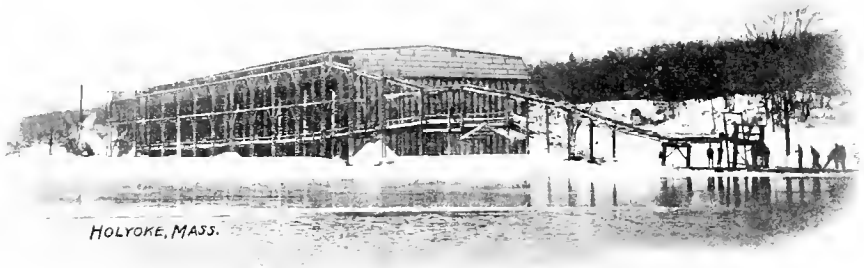

Fig. 65. Elevator Conveyor.

chain carrying each cake from the water to the various doors. Both Incline Elevator and Elevator Conveyor are shown in Figs 64 and 65.

Almost any kind of power may be used on these elevators, providing it is reliable. In the earlier days steam was almost universal, as there was scarcely ever any other power available. The electric motor is now often employed, and the extensive use of electricity has led to its application in many cases. When the combinations are favorable, it has much to recommend it over any other power. The first cost of the machinery needed is much less, no licensed engineer is required, while the actual cost of the power itself is in most cases no more than with steam.

Planing on the Incline.

This has already been mentioned on page 13 as the most inexpensive means of taking care of snow which may fall on the field. There are other reasons in addition which are of much greater importance to the harvester, and some of which would recommend planing even when there has been no snowfall.

Cleanliness in harvesting methods is one of the most valuable assets the iceman can have. The public appreciates a superior article in ice as well as in any other line. Where there is an opportunity of making a choice, ice taken from good water, cleaned of any surface impurities and delivered in a satisfactory shape will take preference over ice lacking these qualities. Even if the field has no snow-ice whatever, the surface must contain impurities of one form or another before it reaches the house.

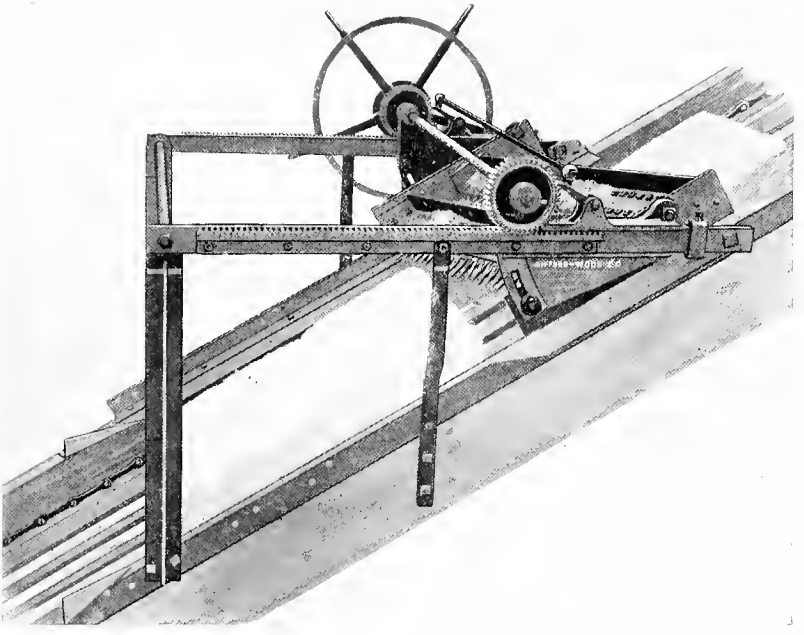

Fig. 66. Eureka Elevator Planer, Movable Carriage Style, No. 252.

The removal of one-half or one inch will take this objectionable matter with it and will accomplish much in favorably advertising the product.

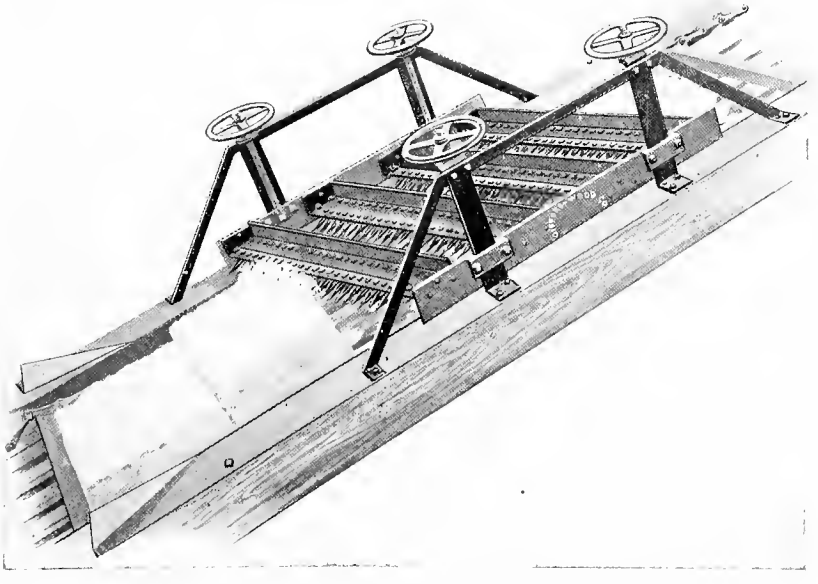

Fig. 67. Eureka Elevator Planer, Stationary Style (Adjustable), No. 254C.

The point which may appeal most strongly to the practical iceman is the ease in packing. Ice that is taken at the same time from different parts of the field may vary considerably in thickness. By making this uniform, level floors are secured in the house and the storing is done much more rapidly. The corrugations separate the blocks, the smooth bottom of one resting on the points of the one below. This treatment makes it easy to take the ice out, and greatly reduces the cost from getting out unplaned ice which has become frozen together.

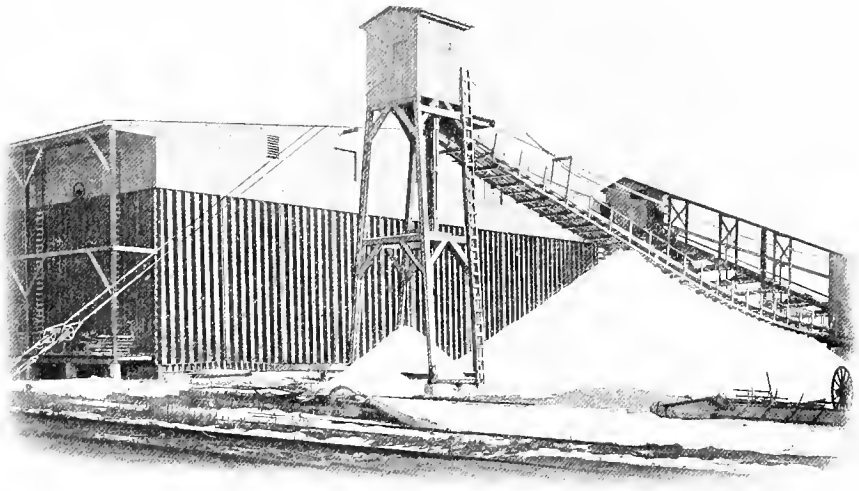

Fig. 68. Suspension Type Chip Conveyor.

By far the greater advantage to be gained from the use of a good, solid Planer with plenty of knife-bars is the storing of cakes of uniform thickness and weight. In deciding upon the size of cake, the trade to be supplied should, of course, be considered. By so doing a length, width and also thickness may be selected which will allow the necessary retail cutting and still give the least amount of waste possible. Attention to this point followed by equal care in throwing out all defective cakes before they reach storage will greatly increase the value of the house contents, as the sales records will show.

The most common thickness desired in different parts of the country is 12½ or 13 inches, and to obtain the advantages referred to the Planer is set for this at the beginning of the season. Filling a large house generally requires two or three weeks, and the field may increase in thickness 6 inches during that time. This means that during the latter part of the harvest 5 or 6 inches must be removed from all the ice, and to take off 8 or 10 inches is not uncommon.

Fig. 69. Handling Chips with Water.

There are two general types of Planers at present in use: the Movable Carriage and the Stationary Knife type. The former, as the name indicates, is so arranged that the cut may be varied instantly and is generally used where the ice is to be corrugated only. Observe Fig. 66.

Fig. 70. Use of House Runs.

The Stationary Knife Planer is a natural result of the practice of planing an entire crop to one thickness, and indeed is to be generally recommended, even if frequently readjusted for changes in thickness. In very cold sections of the country where the field may reach a thickness of 20 or 24 inches before the houses are filled, eight or ten knife-bars are necessary. A Four Knife-bar Planer is shown in Fig. 67.

The large amount of chips made by the Planer must be quickly and cheaply removed. A small cut will result in but few chips and these can be readily handled by a horse Scraper, but in the course of a large harvest, 5,000 or 10,000 tons, or even a greater amount of chips is not uncommon. It needs no argument to show that an army of men with horse Scrapers would be necessary to handle this, the cost of which work would be enormous.

To reduce this expense to a minimum, any one of a number of power appliances may be used. The Chip Conveyor, driven either independently or from the main elevator, is very generally employed, and a Suspension type of Conveyor is shown in Fig. 68. Another efficient method is to float the chips by means of a stream of water delivered to a trough beneath the Planer. This is illustrated in Fig. 69. In some cases the location of the elevator is such that the natural flow of a stream may be utilized for this purpose, but the conditions making this possible are extremely rare.

Housing.

Figure 70 illustrates the interior of a house when nearly filled with 44 x 44-inch ice. Wooden Runs and Skids, as shown in Figs. 71 and 72, convey the ice from the Elevator or Gallery outside the door as far as possible in the house, sufficient slope being given for running to any part of the room with little effort by the men. For this work ordinary Ice Hooks constitute the larger part of the tool equipment, and some use the No. 565 Drag, or Stowing Tongs with long handles, see Fig.

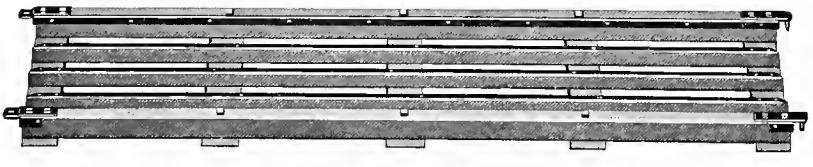

Fig. 71. Wooden Run, with Sides, No. 730.

77, in housing operations as well as in taking ice out. The Gallery, if an Adjustable one, should be only enough higher than the floor level in the room for keeping the ice on the move without using Scratchers. With fixed Galleries, Scratchers are needed for reducing the speed, and considerable back-hauling of the ice will be necessary in packing the end nearer the doors. The chips made by Scratchers in the house should be frequently shoveled out of doors.

Packing on the Flat.

The most common practice of packing is to store the ice on the flat, and the cakes when so placed should have a space of from two to four inches between them, except the two top tiers, which should be tight.

In spacing ice, the "straightener," or man who adjusts the rows of cakes, uses either the No. 465 Starting Chisel, Fig.6, or the No. 458 Bar Chisel, Fig. 80, as a steel bar is much safer than to attempt sys-

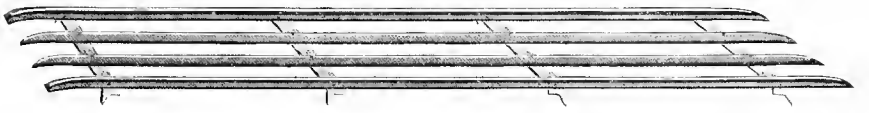

Fig. 72. Four-slat T-iron Skid, No. 726.

tematic spacing with an Ice Hook. Figure 73 is a fine illustration of most excellent packing on the flat.

Fig. 73. Interior of House Showing Corrugation by Elevator Planer.

To prevent shifting following meltage, the tiers should be tied together once every sixth or eighth layer by breaking joints. Where the cakes are oblong in form, some harvesters reverse the arrangement in each layer, thus breaking joints on each tier.

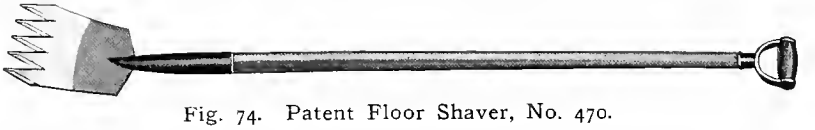

Fig. 74. Patent Floor Shaver, No. 470.

After completing each layer, and before starting another, the surface is dressed down, if the cakes are of uneven thickness, by using either the No. 470 Floor Shaver, shown in Fig. 74, or the 470½ Floor

Leveler, Fig. 75. The latter, however, is such a rapid cutter that it is more useful in evening the ragged surface of layers of ice when packed on edge.

Fig. 75. Floor Leveler, No. 470 1-2.

Packing on Edge.

In parts of the country where ice harvested in winter is thin, or when the cakes must necessarily be housed in thicknesses of wide varia-

Fig. 76.
Eastern Edging-up
Tongs, No. 561.

Fig. 77.
Drag or Stowing
Tongs, No. 565.

Fig. 78.
Utah Edging-up
Tongs, No. 562.

tion, it is a common practice to pack the ice on edge. By this means the floors are kept level, and in case this ice is taken out in the summer at a slow rate, the meltage takes place on the edges of the cakes instead of on their flat surfaces. Tools used for edging ice are usually the

No. 561 or 561½ Eastern Edging-up Tongs, which span the entire cake, Fig. 76, or the Utah Edging-up Tongs with less span, which grasp the cake on the side with one point and on the top with the other, Fig. 78. The No. 470½ Floor Leveler, Fig. 75, above referred to, is adapted to

Fig. 80. Bar Chisel, No. 458.

rapid work in smoothing off lips, or flangers, caused by imperfect breaking in the process of harvesting, and which will make a very rough floor unless trimmed down.

Fig. 81. Summer Bar, Curved Blade, Heavy, No. 460.

As most of the meltage in a house is at the top, the ice should be thoroughly covered as soon as filled. Any one of a variety of materials is used. Hay, straw, sawdust and wood shavings are the most common, hay being generally preferred. Whatever covering is used, it should be dry to serve well as an insulator.

Taking out in Summer.

In locating the house due attention is given to removal of the ice in the summer time. The doors and platform should be so placed that

Fig. 82. Separating Chisel, Knob Handle, No. 495.

the ice may be conveniently lowered and loaded either to wagons or cars.

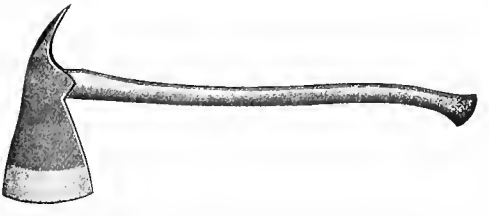

Fig. 83. House Ice Ax, No. 602.

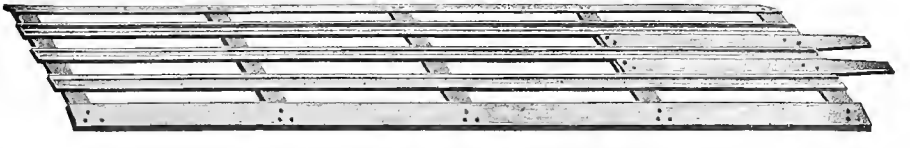

Fig. 84. Wooden Flat Skid, No. 740.

The No. 458 Bar Chisel, Fig. 80, or one of the styles of Summer Bars, Fig. 79, is used in cutting around the cakes to thoroughly clear the spaces left in packing, such as are shown in Fig. 73.

The No. 465 or No. 466 Starting Chisel, see Fig. 6, now comes in for the use for which it was originally made, in the operation of "striking up," by which the blocks of ice are "started" or separated

Fig. 85. Half Oval Iron, No. 754.

from the layer beneath. Some icemen use the Summer Bar, see Fig. 81, for both cutting around and striking up, as one of the styles has a curved blade.

When ice is packed in blocks 44 x 44 inches, it is necessary that they be divided into cakes of 22 x 22 inches before loading cars or

Fig. 86. Patent V Run Iron, No. 750.

wagons. To make this subdivision the No. 409 6-inch Hand Plow, see Fig. 18, is used. In fact, the Hand Plow was originally invented, over

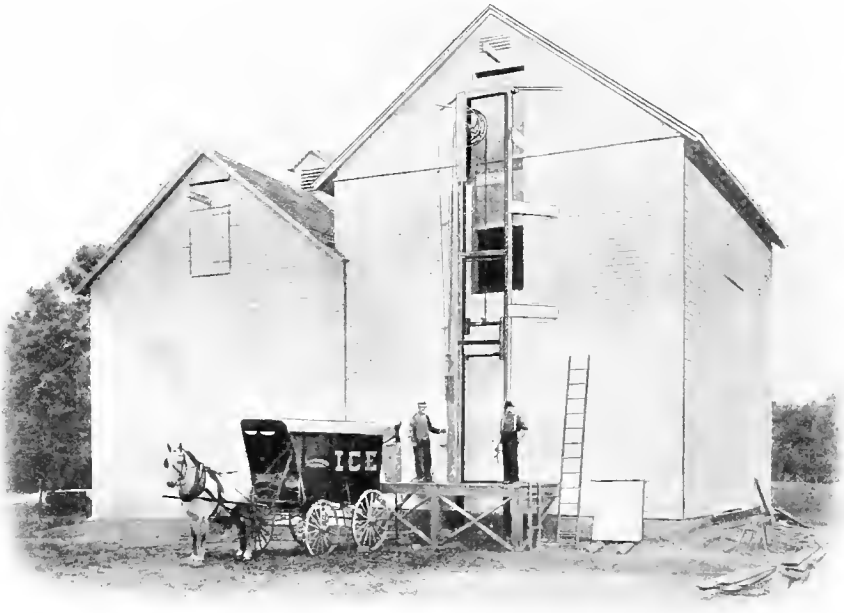

Fig. 87. Gig Lowering Machine.

sixty years ago, for this use, and its employment on the ice field in harvesting operations was secondary.

The No. 495 Separating Chisel, Fig. 82 (also made with a ring handle), which has a long, thin blade, is used in breaking down cakes

Fig. 88. Endless Chain Lowering Machine.

of ice when stored on edge. The No. 601 or No. 602 House Axe, Fig. 83, is also used largely for this work.

The same Skids and Runs, see Figs 71 and 72, used in storing the ice may again be employed in chuting it from any part of the house

to the lowering device outside the door. Large companies usually have a lighter set of Runs for summer use than those used in storing. Wooden Flat Skids, see Fig. 84, are popular as a Run for both purposes, as having no sides, the ice can be pulled off at any point. For Runs having sides, Half Oval Iron, Fig. 85, is used; and for Runs without sides, two of the tracks are ironed with Patent V Run Iron, Fig. 86.

The Gig Lowering Machine shown in Fig. 87 is much used for wagon loading. Where it is necessary to deliver the ice more rapidly to the platform, as in car loading, the Endless Chain Lowering Machine, Fig. 88, is to be recommended. Another device entirely automatic in its working is the Pneumatic Lowering Machine. This, and other appliances, are thoroughly illustrated in our complete catalog, which will be sent on application.

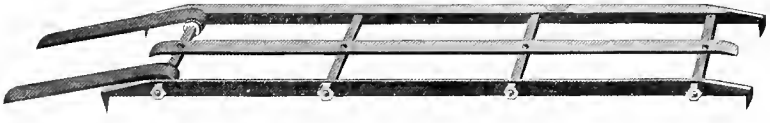

Fig. 89. House Run, No. 720.

In loading wagons the No. 720 House or Wagon Run, 6 feet long, see Fig. 89, is a most useful article which is widely used. In loading cars, the run used is generally 7 feet long, and has stoppers welded on the bottom. See Fig. 90 for illustration of No. 722 Car Run.

Fig. 90. Car Run, No. 722.

Next to securing payment for the commodity, the last chapter of interest to the seller in the history of a cake of ice is —

Delivery to the Customer.

This subject could be written upon at great length. Different conditions exist in different localities. A great variety in styles of Ice Axes, some narrow, some wide, some square and some round-bitted; Ice Tongs, a dozen different kinds of stock styles, to say nothing of many more private patterns; Ice Shavers; Ice Breakers; Hand Ice Saws; Ice Cleavers; Ice Awls, etc., are always kept in stock by us to meet all requirements. Hoisting Blocks; Creepers; Scales or Balances; Wooden Soled Shoes; Rubber Aprons, and many other conveniences are also described and priced in our catalog.

One very important element in the successful delivery of ice we cannot supply, that is, the driver. To him, and to the foreman of your routes, you must trust much. Even with the coupon system well installed, you must depend for the best success upon good men. If your luck has been poor, how would the following do?

ICE TOOLS
OF QUALITY

FOR the convenience of our customers, we carry large stocks of Ice Tools with the following agencies:

Sickels-Loder Co.,	35 Barclay Street,	New York, N. Y.
Standard Scale & Supply Co.,	35 South 4th Street,	Philadelphia, Pa.
Standard Scale & Supply Co.,		Pittsburg, Pa.
The Fred W. Wolf Co.,		Atlanta, Ga.
Henry C. Weber & Co.,		Detroit, Mich.
Morley Bros.,		Saginaw, Mich.
Simmons Hardware Co., Inc.,		St. Louis, Mo.
Richards & Conover Hardware Co.,		Kansas City, Mo.
Farwell, Ozmun, Kirk & Co.,		St. Paul, Minn.
W. K. Morison & Co.,		Minneapolis, Minn.
James Morton & Son Co.,		Omaha, Neb.
The George Tritch Hardware Co.,		Denver, Col.
Anaconda Copper Mining Co. (Hdwe. Dept.),		Butte, Mont.
The Salt Lake Hardware Co.,		Salt Lake City, Utah.
Holley-Mason Hardware Co.,		Spokane, Wash.
Baker & Hamilton,		San Francisco, Cal.
Baker & Hamilton,		Sacramento, Cal.
Edwin J. Banfield,	120 Adelaide Street, West,	Toronto, Can.

Our Branch Houses at Boston and Chicago are maintained for the convenience and accommodation of our customers.

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